THEORY OF COMPUTATION

SOLUTIONS

1. Ambiguous grammar is NOT accepted by

(a) Regular language
(b) DCFL
(c) CFL
(d) Recursive language

Solution: Option (b)

Explanation:

a) Regular language can accept Ambiguous grammar
b) DCFL- does not accept Ambiguous grammar
c) CFL – may or may not accept Ambiguous grammar
d) Recursive language- may or may not accept Ambiguous grammar

So, Ans is (b).

2. How many two state DFA's exists over alphabet (0, 1) where X and Y are two states and X is always initial state, Y is always final.

(a) 16
(b) 20
(c) 32
(d) 64

Solution: Option (a)

Explanation:

X is initial, Y is always final.

Transition for X:

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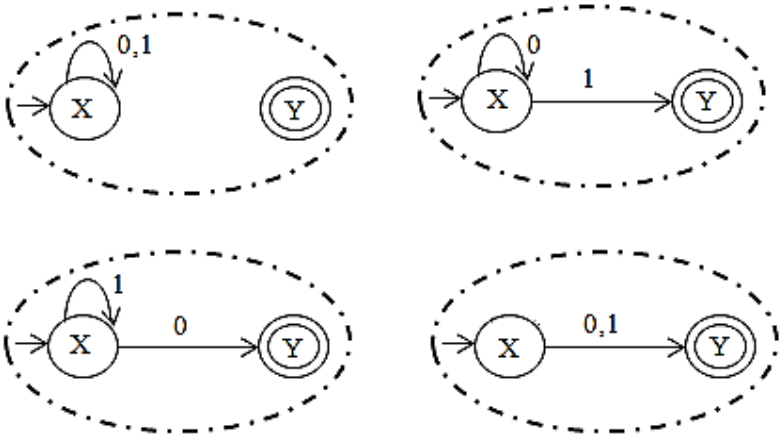
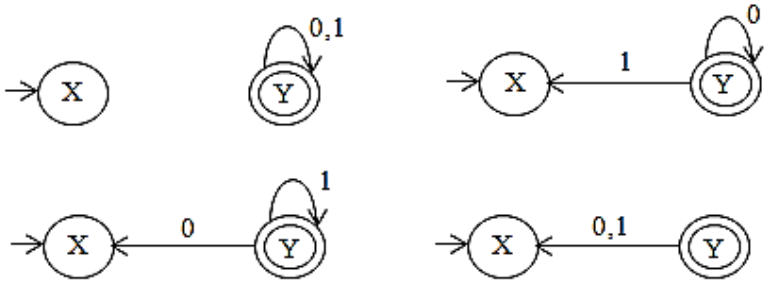


4 possibilities → For each of these

Y transactions can be:



So, total combinations 4×4 = 16

3. How many DFA's exist over alphabet (0, 1) of two states X and Y where both states are always non-final?

(a) 16 (b) 20
(c) 32 (d) 64

Solution: Option (c)

Explanation:

Both states always Non-final. Same as previous. But here initial state is not mentioned. So, any of X or Y can be initial.

So, Ans = 2×16 = 32 → (c)

4. Which one of the following is False?

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I. A DFA can contain one initial state and one final state
II. A NFA can contain many initial states and many final states
III. A DFA can contain many initial states and many final states
IV. A NFA can contain one initial state and many final states

(a) I, II
(b) II, III
(c) I, IV
(d) III, IV

Solution: Option (b)

Explanation:

I) True for DFA
II) False, NFA can contain one initial state
III) False, DFA contains one initial state
IV) True, for NFA

5. $L = \{0^{n+m}\ 1^{n+m}\ 0^{m} \mid n, m \geq 0\}$

The above language is

(a) CFL but not regular
(b) CSL but not CFL
(c) RE but not CSL
(d) none of the above

Solution: Option (c)

Explanation:

$L = \{0^{n+m}\ 1^{n+m}\ 0^{m} \mid n, m \geq 0\}$

↳ This language is not CFL as one-stack can't do this.
↳ Not CSL as it doesn't accept null string.
↳ RE can do and capture this.

6. $L_1 = \{(xy)^m\ (yz)^m, m \geq 1\}$
$L_2 = \{a^m b^n c^k \mid m>n \text{ or } m<n\}$

Which of the following is True?

(a) L_1 is CFL, L_2 is DCFL
(b) L_1 is DCFL, L_2 is CFL
(c) Both L_1, L_2 are CFLs
(d) Both L_1, L_2 are DCFLs

Solution: Option (b)

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Explanation:

$L_1 = \{(xy)^m (yz)^m, m \geq 1\}$

↳ DCFL → Push Pop defined

$L_2 = \{a^m b^n c^k \mid m>n \text{ or } m<n\}$

↳ CFL → Push Pop not defined

7. How many total numbers of substrings are possible out of the string abbbccd?

(a) 25
(b) 27
(c) 28
(d) 29

Solution: Option (a)

Explanation:

abbbccd – length = 7

1 bit sub-strings a, b, c, d = 4
2 bit sub-string ab, bb, bc, cc, cd = 5
3 bit sub-string abb, bbb, bbc, bcc, ccd = 5

From 3 bits onwards, no. of substrings possible = $\frac{5\times6}{2} + 1(for\ null\ string) = 16$

Total no. of substrings possible = 4 + 5 + 16 = 25

8. $L = \{x^a y^a : a \geq 1\}$

I. L^3 is context free.
II. $\lceil\sqrt{L}\rceil$ is not context free.

Which of the following is correct?

(a) I only
(b) II only
(c) Both I and II
(d) None of the above

Solution: Option (a)

Explanation:

$L = \{x^a y^a : a \geq 1\}$

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I. L^3 is context free → True

II. $\lceil\sqrt{L}\rceil$ is not context free → False

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